THE CLAIMS

1. A method for interpolative coding input signals, said signals decomposed into or composed of a slowly evolving waveform and a rapidly evolving waveform having a magnitude, the method incorporating at least one of the following steps:

(a) analysis-by-synthesis vector quantization of the rapidly evolving waveform parameter;

(b) parametrizing the magnitude of the rapidly evolving waveform;

(c) incorporating temporal weighting in the AbS VQ of the REW;

(d) incorporating spectral weighting in the AbS VQ of the REW;

(e) applying a filter to a vector quantizer codebook in the analysis-by-synthesis vector-quantization of the rapidly evolving waveform whereby to add self correlation to the codebook vectors; and

(f) using a coder in which a plurality of bits therein are allocated to the rapidly evolving waveform magnitude.

2. The method of claim 1 further comprising analysis-by-synthesis vector quantization of the slowly evolving waveform.

3. The method of claim 1 wherein said signal is speech.

4. The method of claim 1 wherein said method incorporates each of steps (a) through (c).

5. A method for interpolative coding input signals, said signals decomposed into or composed of a slowly evolving waveform and a rapidly evolving waveform having a magnitude, comprising:

(a) analysis-by-synthesis vector quantization of the rapidly evolving waveform parameter;

(b) analysis-by-synthesis quantization of the slowly evolving waveform;

(c) parametrizing the magnitude of the rapidly evolving waveform;

(d) incorporating temporal weighting in the analysis-by-synthesis vector quantization of the rapidly evolving waveform; and

(e) incorporating spectral weighting in the analysis-by-synthesis vector quantization of the rapidly evolving waveform.

6. The method of claim 1 in which in the step of analysis-by-synthesis of a first vector-quantization of the slowly evolving waveform is predicted based on the vector quantization of the rapidly evolving waveform and a second vector quantization of the slowly evolving waveform.

7. A method for interpolative coding input signals, said signals decomposed into or composed of a rapidly evolving waveform, the method incorporating analysis-by-synthesis vector quantization of the rapidly evolving waveform parameter.

8. A method for interpolative coding input signals, said signals decomposed into or composed of a slowly evolving waveform and a

rapidly evolving waveform having a magnitude, comprising parametrizing the magnitude of the rapidly evolving waveform.

9. The method of claim 8 in which the method of parametrizing the magnitude of the rapidly evolving waveform is in accordance with the formula:

$$\widehat{R}(\omega,\xi)=\sum_{i=0}^{I-1}\widehat{\gamma}_i(\xi)\omega^i \quad , \quad 0\le\omega\le\pi \quad ; \quad 0\le\xi\le 1$$

where $\omega$ is the angular frequency, and $I$ is the representation order.

10. A method for interpolative coding input signals, said signals decomposed into or composed of a rapidly evolving waveform, comprising using a coder in which a plurality of bits therein are allocated to the rapidly evolving waveform magnitude.

11. The method of claim 10 in which 7 bits are allocated to the rapidly evolving waveform magnitude in the coder.

12. A method for modeling vector by set of basis functions, and a piecewise linear model, where the model interpolation factor is in accordance with the formula:

$$\alpha_{opt}=\frac{(\widehat{\boldsymbol{\gamma}}_n-\widehat{\boldsymbol{\gamma}}_{n-1})^T(\boldsymbol{\gamma}-\widehat{\boldsymbol{\gamma}}_{n-1})}{\left\|\widehat{\boldsymbol{\gamma}}_n-\widehat{\boldsymbol{\gamma}}_{n-1}\right\|^2} \tag{19}$$

for non weighted distortion measure, and it is in accordance with the formula:

$$\alpha_{opt}=\frac{(\widehat{\boldsymbol{\gamma}}_n-\widehat{\boldsymbol{\gamma}}_{n-1})^T\boldsymbol{\Psi}(\boldsymbol{\gamma}-\widehat{\boldsymbol{\gamma}}_{n-1})}{(\widehat{\boldsymbol{\gamma}}_n-\widehat{\boldsymbol{\gamma}}_{n-1})^T\boldsymbol{\Psi}(\widehat{\boldsymbol{\gamma}}_n-\widehat{\boldsymbol{\gamma}}_{n-1})} \tag{27}$$

for weighted distortion measure, and the model coefficient vector is in accordance with the formula:

25010134.1

$$\hat{\gamma}(\xi) = (1-\alpha_{opt})\hat{\gamma}_{n-1} + \alpha_{opt}\hat{\gamma}_n \qquad (16).$$

13. A method of using a weighted correlation matrix of orthonormal functions, $\Psi(W(\omega))$, its elements are:

$$\Psi_{i,j}(W(\omega)) = \int_0^{\pi} W(\omega)\psi_i(\omega)\psi_j(\omega)d\omega, \qquad (23)$$

in order to use an equivalent distortion, between two weighted vectors, in a model which uses representation of the vectors by a combination of basis functions.

14. The method of claim 13 whithout using the the weighting $W(\omega)$, or assuming that the weighting is equal unity.

15. A method for computing time-varying orthonormal basis function, in order to eliminate using the matrix $\psi$, by defining the scalar product to incorporate the time-varying spectral weighting, wherein the respective orthonormal basis functions are in accordance with the formula:

$$\int_0^{\pi} W(\omega)\psi_i(\omega)\psi_j(\omega)d\omega = \delta(i-j) \qquad (28)$$

where $\delta(i-j)$ denotes Kroneker delta and the respective parameter vector is in accordance with the formula:

$$\gamma = \int_0^{\pi} W(\omega)R(\omega)\psi(\omega)d\omega \qquad (29).$$

25010134.1

16. A method for using distortion in a form of a simple parameter squared error which is equivalent or related to complex distortion between vectors by using sensitivity function as weighting for the parameter squared error, that is in accordance with the formula:

$$w_s(\xi(m)) = \left(\frac{\partial \widehat{\gamma}}{\partial \xi}\right)^T \Psi \left(\frac{\partial \widehat{\gamma}}{\partial \xi}\right)\Bigg|_{\xi(m)} \quad \textbf{(34).}$$

17. A method for vector quantization of set of vectors using parametrization of each vector in the set, and applying vector quantization to the vector of parameters.

18. The method of claim 17 using weighted distortion.

19. A method for dual (or higher order) prediction of vectors.

20. A method for dual (or higher order) predictive coding of vectors.

21. The method of claim 19 using Analysis-by-Synthesis.

22. A method for predicting the slowly evolving waveform from both rapidly evolving waveform and past slowly evolving waveform data.

23. A method for predictive coding of the slowly evolving waveform using both rapidly evolving waveform based prediction and past slowly evolving waveform prediction.

24. A method of using codebooks for each subrange in subdivided parameter range in order to improve coding efficiency.

25. A method for interpolating weighted distortion in accordance with the formula:

$$\begin{aligned} D_w\left(R, \widehat{R}(\xi)\right) &= \left(\gamma - (1-\alpha)\widehat{\gamma}_{n-1} - \alpha\widehat{\gamma}_n\right)^T \Psi\left(W(\omega)\right)\left(\gamma - (1-\alpha)\widehat{\gamma}_{n-1} - \alpha\widehat{\gamma}_n\right) \\ &= \gamma^T\Psi\gamma + (1-\alpha)^2\widehat{\gamma}_{n-1}{}^T\Psi\widehat{\gamma}_{n-1} + \alpha\widehat{\gamma}_n{}^T\Psi\widehat{\gamma}_n - 2(1-\alpha)\gamma^T\Psi\widehat{\gamma}_{n-1} - 2\alpha\gamma^T\Psi\widehat{\gamma}_n + 2\alpha(1-\alpha)\widehat{\gamma}_{n-1}\Psi\widehat{\gamma}_n \end{aligned}$$

(26).

25010134.1

26. The method of claim 25 without using the weighting matrix $\Psi$, or assuming that the weighting is a unity matrix.

27. A method for separating the total distortion to a sum of modeling distortion and quantization distortion in accordance with the formula:

$$\sum_{m=1}^{M} D_w\left(R(m), \hat{R}(\xi(m))\right) = \sum_{m=1}^{M} D_w\left(R(m), \tilde{R}(\xi(m))\right) + \sum_{m=1}^{M} D_w\left(\tilde{R}(\xi(m)), \hat{R}(\hat{\xi}(m))\right)$$

(31).

28. A method for quantization using simple quantization distortion, based on the separation method of claim 27.

29. A speech coding system using waveform interpolation comprising at least one of the following steps:

(a) analysis-by-synthesis vector quantization of a rapidly evolving waveform parameter;

(b) parametrizing a magnitude of a rapidly evolving waveform;

(c) incorporating temporal weighting in the AbS VQ of the REW;

(d) incorporating spectral weighting in the AbS VQ of the REW;

(e) applying a filter to a vector quantizer codebook in the analysis-by-synthesis vector-quantization of the rapidly evolving waveform whereby to add self correlation to the codebook vectors; and

(f) using a coder in which a plurality of bits therein are allocated to the rapidly evolving waveform magnitude.

25010134.1

30. A speech coding system using waveform interpolation comprising:

(a) analysis-by-synthesis vector quantization of a rapidly evolving waveform parameter;

(b) analysis-by-synthesis quantization of a slowly evolving waveform;

(c) parametrizing a magnitude of the rapidly evolving waveform;

(d) incorporating temporal weighting in the analysis-by-synthesis vector quantization of the rapidly evolving waveform; and

(e) incorporating spectral weighting in the analysis-by-synthesis vector quantization of the rapidly evolving waveform.

31. A speech coding system using waveform interpolation of input signals, said signals decomposed into or composed of a rapidly evolving waveform, comprising incorporating analysis-by-synthesis vector quantization of the rapidly evolving waveform parameter.

32. A speech coding system using waveform interpolation of input signals, said signals decomposed into or composed of a slowly evolving waveform and a rapidly evolving waveform having a magnitude, comprising parametrizing the magnitude of the rapidly evolving waveform.

33. A speech coding system using waveform interpolation of input signals, said signals decomposed into or composed of a rapidly evolving waveform, comprising using a coder in which a plurality of bits therein are allocated to the rapidly evolving waveform magnitude.

34. A speech coding system using waveform interpolation comprising dual (or higher order) prediction of vectors.

35. A speech coding system using waveform interpolation comprising dual (or higher order) predictive coding of vectors.